

REMARKS/ARGUMENTS

This is filed in response to the Office Action dated 17 October 2007.

Applicant has amended claims 1, 30 and 31 to better clarify the subject matter of the invention.

Regarding the outstanding Office Action, Applicant takes note of points 1-4,6, and 8 of the Office Action. In response to point 5 of the Office Action, claim 17 has been amended to claim the feature that the multi-dimensional data is of a regional datacube. Support for such an amendment may be found in paragraphs [0039]-[0042] of the specification.

Regarding point 7 of the Office Action, the Examiner opined that previous claims 1-2, 4-5, 9, 11, and 30-32 were anticipated by Tanaka (US 4 862 261). Applicant traverses this objection by noting that Tanaka does not disclose the subject matter of amended claims 1, 30, and 31. Specifically, it is noted that claim 1 now recites :

A method for compressing multi-dimensional data comprising the steps of :

- a) receiving the multi-dimensional data, the multi-dimensional data comprising a plurality of data vector indicative of an image of an object;
- b) separating the plurality of data vectors into at least two clusters based on similarity of the data vectors such that similar data vectors are grouped together into one of said at least two clusters; and,
- c) providing each of the at least two clusters to at least a compression engine for processing.

It is further noted that claim 31 now recites :

A system for compressing multi-dimensional data comprising :

a first port for receiving the multi-dimensional data;

electronic circuitry in data communication with the first port, the electronic circuitry for performing the steps of :

- a) receiving the multi-dimensional data, the multi-dimensional data comprising a plurality of data vectors indicative of an image of an object;
- b) separating the plurality of data vectors into at least two clusters based on similarity of the data vectors such that data vectors with similar characteristics are grouped together into one of said at least two clusters;
- c) providing each of the at least two clusters to at least a compression engine for processing;
- d) determining a plurality of codevectors through training for approximating each of the data vectors of a cluster of the at least two clusters with a fidelity above a predetermined threshold based on the data vectors contained in the cluster;
- e) encoding each of the data vectors of a cluster using a codevector of the plurality of trained codevectors;
- f) storing the plurality of trained codevectors in a codebook; and,
- g) storing in an index map an index for each of the data vectors of a cluster indicative of a codevector's location within the codebook; and,

a second port in data communication with the electronic circuitry for providing the regional codebook and the regional index map

wherein said multi-dimensional data comprises a multi-dimensional data cube.

As a preliminary matter, Applicant respectfully notes that what is referred to as a "block" in Tanaka is quite different from what is referred to as a "cluster" in Applicant's claims. In Tanaka, a "block" refers to a rectangle ($P \times Q$ picture elements) portion (or region) of an image. A block containing $M = P \times Q$ adjacent picture

elements is defined as a vector in order to divide an image into vectors for compression using vector quantization. In Applicant's disclosure and claims, a "cluster" refers to a group of vectors having similar characteristics.

Regarding the amended claims, the Examiner's attention is directed to clause b) of claim 1 and subclause b) of claim 31. From claim 1, it is noted that the plurality of data vectors are separated based on similarities of the data vectors such that similar data vectors are grouped together into one of the clusters. From claim 31, it is noted that the plurality of data vectors are separated based on the similarity of data vectors such that data vectors with similar characteristics are grouped together into one of the clusters. Support for such features of the invention can be found in paragraph [0038] of the specification. As noted in the specification:

the similar spectral vectors within a cluster are not located within one specific area of the regional data cube but are associated with particular scenes such as a certain type of vegetation or a water surface

Tanaka does NOT disclose this. Tanaka discloses obtaining a vector related to a specific block or region of an image and processing that vector (see Tanaka, Fig. 2, Fig. 3 and col. 5, lines 10-25).

Tanaka therefore does NOT disclose grouping data vectors into clusters based on similarity of the data vectors. A vector in Applicant's invention is NOT formed by cutting a 2-dimensional image into block. By way of example, a vector in Applicant's invention is an N_b -band reflectance spectrum of a ground pixel in a satellite hyperspectral datacube.

As a further example from Tanaka of "blocking", from Fig 2 and Fig 3, regions R1 is adjacent region B'1 and the data from this general area is to be processed together. Unfortunately, this type of processing is *exactly* the type of processing that introduces distortions that Applicant's invention seeks to overcome (see paragraph [0032] and paragraph [0034]). Tanaka's processing would introduce a spatial boundary between

blocks (regions) that are processed separately. This spatial boundary would result in visual artefacts after the image is decompressed. Thus, if one uses the method disclosed in Tanaka, the block (region) of size $P \times Q$ picture elements (from Fig.2 of Tanaka) would be processed separately from the adjacent block (region). There would therefore be visual artefacts between these two blocks (regions) after the image is decompressed.

In Applicant's invention, data vectors are grouped together based on their similarities in characteristics. Thus, as explained in the specification, data vectors associated with particular scenes are grouped together into a cluster regardless of which area in the image these data vectors relate to. The clusters into which data vectors are grouped into are therefore not location or spatially based (as in Tanaka) but are, rather, characteristic based. Data vectors with similar characteristics are grouped together into a cluster and are processed together and data vectors with dissimilar characteristics are not grouped together. With Tanaka, there is no provision for characteristic based grouping of data vectors into clusters – in Tanaka, it does not matter what the characteristics of the data vectors are. In Tanaka, $M = P \times Q$ adjacent picture elements in the same area (block) are grouped into a *VECTOR* for the purpose of dividing an image into vectors for compression using vector quantization.

It is also respectfully submitted that Tanaka only relates to a two-dimensional image while Applicant's invention relates to more complicated multi-dimensional data (see amended claim 31). As noted in the specification, Applicant's invention relates to "hyper-spectral data" which typically takes the form of multi-dimensional data cubes. The vectors in Tanaka relate to a block or portion of an image. This block-based vector is different from the multidimensional data which relates to the present application. As an example, as noted in the claims and specification, vectors in the Applicant's invention relate to reflectance spectra of ground pixels of a satellite hyperspectral data cube (see paragraphs [003], [006], and [0013] which explain hyper-spectral data cubes).

Based on the above points, it is therefore submitted that amended claims 1, 30 and 31 are allowable in light of Tanaka. Applicant respectfully submits that Tanaka does not

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disclose the subject matter of amended claims 1, 30 and 31 and allowance of these claims is respectfully solicited. No new matter has been added.

Regarding the dependent claims 2-11, 17, and 32, it is respectfully submitted that these claims are dependent on claims 1 and 31 and, as such, should also be allowable based on the above points.

Conclusion

Should any further fees or payments be necessary for entry of this amendment and further prosecution of this application, the undersigned hereby authorizes the Commissioner to debit and/or credit our Deposit Account No. 16-0600.

It is respectfully submitted that the application is in allowable condition. However, if any objections remain, the Examiner is respectfully requested to telephone the undersigned with a view to resolving such objections as expeditiously as possible.

Respectfully Submitted,
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